Claims

1. Device for irradiation of at least one article/product by means of beams, especially by means of high-energy electron beams which can be produced in an irradiation system, the beams emerging from the electron accelerator in a radiation area,

characterized by at least one scanner means (54) which defines the radiation area (56), the radiation area (56) being formed spaced apart from the scanner means (54) in at least one plane (E_n) in which there is at least one transport means (TE_n), and by means of which at least one bar-shaped/pipe-shaped article (G_r) and/or other articles (G_n) can be moved into the irradiation position.

2. Device as claimed in claim 1, wherein at least one radiation area (56) is formed on at least one radiation exit window (48) and in at least one plane (E_n) which is spaced apart from the scanner means (54) in the x-direction (x) by a scan magnet and in the y-direction (y) by a wobbulator.

3. Device as claimed in claim 1 and 2, wherein at least one radiation area (56) is set in the spaced planes (E_n) by the focussing magnet of the scanner means (54), deviating in the x-direction (x) to the radiation exit window (48).

4. Device as claimed in claim 1 to 3, wherein the scanner means (54) comprises at least a first scan horn (54A) with a first radiation exit window (48A) and a second scan horn (54B) with a second radiation exit window (48B).

5. Device as claimed in one of the preceding claims, wherein at least one bar-shaped/pipe-shaped article (G_r) can be moved parallel to the x-direction (x) on one x-scan axis (88) by means of a bar/pipe transport means (TE_2) into a second plane (E_2) into the radiation area (56) into the

irradiation position.

6. Device as claimed in one of the preceding claims, wherein the bar/pipe transport device (TE_2) for the bar-shaped/pipe-shaped article (G_r) comprises at least a second feed means (TEZ_2).

7. Device as claimed in one of the preceding claims, wherein the second feed means (TEZ_2) for the bar-shaped/pipe-shaped article (G_r) comprises an incoming storage (12), an incoming individual conveyor (14), a first lowering path (16) and an insertion path (18) up to a pre-zone (VZ).

8. Device as claimed in one of the preceding claims, wherein the bar/pipe transport means (TE_2) for the bar-shaped/pipe-shaped article (G_r) comprises at least a second irradiation transport means (TEB_2) in the second plane (E_2).

9. Device as claimed in one of the preceding claims, wherein the second irradiation transport means (TE_2) for the bar-shaped/pipe-shaped article (G_r) is a bar irradiation section (10).

10. Device as claimed in one of the preceding claims, wherein the bar/pipe transport means (TE_2) for the bar-shaped/pipe-shaped article (G_r) comprises at least a second removal means (TEA_2) from the post-zone (NZ) of the irradiation space (52).

11. Device as claimed in one of the preceding claims, wherein the second removal means (TEA_2) for the bar-shaped/pipe-shaped article (G_r) comprises an alternating path (22), a second lowering path (24), a rollback path (26), a lifting path (28), an outgoing individual conveyor (30) and an outgoing storage (32).

12. Device as claimed in one of the preceding claims, wherein the bar irradiation section (20) extends between a pre-zone (VZ) and a post-zone (NZ) and an irradiation space (52).

13. Device as claimed in one of the preceding claims, wherein the bar irradiation section (20)

comprises at least one bar transport station (34).

14. Device as claimed in one of the preceding claims, wherein the bar transport station (34) is located parallel to the x-scan axis (88) of at least one scan horn (54, 56).

15. Device as claimed in one of the preceding claims, wherein the bar transport station (34) has at least one column mechanism (34A) and at least one holding arm (34B).

16. Device as claimed in one of the preceding claims, wherein the bar transport station (34) has a rotation device (36).

17. Device as claimed in one of the preceding claims, wherein the bar transport station (34) has a translation device (38).

18. Device as claimed in one of the preceding claims, wherein the bar transport station (34) has a vertical adjustment device (40).

19. Device as claimed in one of the preceding claims, wherein the bar transport station (34) has a horizontal adjustment device (42).

20. Device as claimed in one of the preceding claims, wherein the rotation device (36), the translation device (38) and the vertical adjustment device (40) are made by means of at least one allround roller (46).

21. Device as claimed in one of the preceding claims, wherein the rotation device (36) has a first drive (80) on the allround roller (46).

22. Device as claimed in one of the preceding claims, wherein the translation device (38) has a second drive (82) on a driver chain.

23. Device as claimed in one of the preceding claims, wherein the vertical adjustment device

(40) has a third drive (84) on a chain in the column mechanism (34A).

24. Device as claimed in one of the preceding claims, wherein the horizontal adjustment device (42) has a fourth drive (84) on the holding arm (34B).

25. Device as claimed in one of the preceding claims, wherein at least one flexible pipe (G_{fr}) can be moved parallel to the x-direction (x) on the x-scan axis (88) or perpendicular to the x-direction (x) in the y-scan axis (90) by a pipe transport means (TE_1) into the first plane (E_1) into the irradiation position.

26. Device as claimed in one of the preceding claims, wherein the pipe transport means (TE_1) for a flexible pipe (G_{fr}) comprises at least one first feed means (TEZ_1).

27. Device as claimed in claim 1, wherein the pipe transport means (TE_1) for a flexible pipe (G_{fr}) comprises at least a first irradiation transport means (TEB_1) in the first plane (E_1).

28. Device as claimed in one of the preceding claims, wherein the pipe transport means (TE_1) for a flexible pipe (G_{fr}) comprises at least one first removal means (TEA_1.)

29. Device as claimed in one of the preceding claims, wherein at least a first feed means (TEZ_1) and at least a first removal means (TEA_1) comprise a first winding assembly (74A) and a second winding assembly (74B).

30. Device as claimed in one of the preceding claims, wherein at least the first irradiation means (TEB_1) comprises guide rollers (76) and deflection rollers (78).

31. Device as claimed in one of the preceding claims, wherein at least one individual item (G_s) can be moved perpendicular to the x-direction (x) in the y-scan axis (90) by means of the individual item transport means (TE_3) into the third plane (E_3) into the irradiation position.

32. Device as claimed in one of the preceding claims, wherein the individual item transport means (TE_3) for an individual item (G_s) comprises at least a third feed means (TEZ_3).

33. Device as claimed in one of the preceding claims, wherein the individual item transport means (TE_3) for an individual item (G_s) comprises at least a third irradiation transport means (TEB_3) in the third plane (E_3).

34. Device as claimed in one of the preceding claims, wherein the individual item transport means (TE_3) for an individual item (G_s) comprises at least a third removal means (TEA_3).

35. Device as claimed in one of the preceding claims, wherein at least one third feed means (TEZ_3), at least one third irradiation transport means (TEB_3) and at least one third removal means (TEA_3) comprises a conveyor means (72A, 72B, 72C).

36. Device as claimed in one of the preceding claims, wherein at least one third feed means (TEZ_3) or at least one third removal means (TEA_3) comprises a turning station (70).

37. Device as claimed in one of the preceding claims, wherein each transport means (TE_1, TE_2, TE_3) forms one labyrinth (10A, 10B, 10C) at a time.

38. Device as claimed in one of the preceding claims, wherein at least one bar-shaped/pipe-shaped article (G_r) is pipes or bars or the like.

39. Device as claimed in one of the preceding claims, wherein the pipes or bars or the like have a diameter from 10 mm to 500 mm.

40. Device as claimed in one of the preceding claims, wherein the pipes or bars or the like have a length from 5,000 mm to 12,000 mm.

41. Device as claimed in one of the preceding claims, wherein at least one flexible pipe (G_{fr})

is a flexible pipe, a cable or the like.

42. Device as claimed in one of the preceding claims, wherein the flexible pipes or the cable or the like have a diameter from 1 mm to 160 mm, preferably 14 mm to 63 mm.

43. Device as claimed in one of the preceding claims, wherein the flexible pipes or the cable or the like are drum-wound articles.

44. Device as claimed in one of the preceding claims, wherein at least one individual item (G_s) is a cardboard product or bunches or the like.

45. Device as claimed in one of the preceding claims, wherein the cardboard product or bunches or the like have a maximum length/width/height of 1200 mm / 1200 mm / 800 mm.

46. Device as claimed in one of the preceding claims, wherein the bar-shaped/pipe-shaped article (G_r) has an auxiliary wall for holding several thin pipes or bars.

47. Process as claimed in claim 46, wherein the auxiliary wall is a cardboard sleeve or a thin-walled PE pipe.

48. Process for irradiating at least one article/product by means of beams, especially by means of high-energy electron beams which have been produced in an irradiation system, the beams emerging in a certain radiation area and at least one article/product being supplied to the radiation area, irradiated in the radiation area and being removed from the irradiation area, wherein at least one bar-shaped/pipe-shaped article (G_r) and/or other articles (G_n) are supplied to at least one plane (E_n), the radiation area (56) is assigned to this at least one plane (E_n) and at least one article/product (G_r/G_n) is moved into the irradiation position and is irradiated.

49. Process as claimed in claim 48, wherein at least one bar-shaped/pipe-shaped article (G_r)

through a second labyrinth (10B)

a) is stored in the incoming storage (12) and

b) separated by means of an incoming individual conveyor (14) and

c) lowered by means of a first lowering path (16) into a second plane (E_2) and

d) transported by means of an insertion path (18) into a pre-zone (VZ) and

e) transported by the second irradiation transport means (TEB_2) from the pre-zone (VZ) along the x-scan axis (88) parallel to the x-direction (x) through the radiation area (56) into the post-zone (NZ) and

f) is accepted from the post-zone (NZ) from an alternating path (22) and transported to a second lowering path (24) and

g) lowered by means of the second lowering path (24) and

h) by means of a rollback path (26) is rolled to a lifting path (28) and

i) lifted by means of the lifting path (28) and

j) is transported by the outgoing individual conveyor (30) to the outgoing storage (32) and

k) is stored in the outgoing storage (32).

50. Process as claimed in claim 49, wherein at least one bar-shaped/pipe-shaped article (G_r) is transported by means of the second irradiation transport means (TEB_2) from the pre-zone (VZ) along the x-scan axis (88) parallel to the x-direction (x) into the post-zone (NZ) and

e1) is rotated at the same time by means of a rotation device (36) around its own axis and/or

e2) is re-adjusted vertically by means of a vertical adjustment device (40) within a first and the second plane (E_1, E_2) and/or

e3) is re-adjusted horizontally by means of a horizontal adjustment device (42) out of the x-scan axis (88) within the first or second plane (E_1, E_2).

51. Process as claimed in claim 48, wherein at least one flexible pipe (G_{fr}) through a first labyrinth (10A)

a) is unrolled by means of a first winding assembly (74A) and

b) is transported from a first irradiation transport means (TEB_1) parallel to the x-direction (x) on the x-scan axis (88) or perpendicular to the x-direction (x) in the y-scan axis (90) through the radiation area (56) by means of deflection and guide rollers (76, 78) and

c) is wound up by means of a second winding assembly (74B).

52. Process as claimed in claim 48, wherein an individual item (G_s) is transported through a third labyrinth (10C)

a) by means of at least a first conveyor means (72A) and

b) is transported from a third irradiation transport means (TEB_3) perpendicular to the x-direction (x) on the y-scan axis (90) by means of at least the second conveyor means (72B/72B') through the radiation area (56) and

c) is removed by means of at least the third conveyor means (72c).

53. Process as claimed in claim 52, wherein at least one individual item (G_s) is supplied or removed by means of at least the first or third conveyor means (72A, 72C) and

c1) is turned by means of a turning station (70) on the first or third conveyor means (72A, 72C).

54. Process as claimed in claim 48, 49, 50, 51, wherein at the same time flexible pipe (G_{fr}) and the bar-shaped/pipe-shaped articles (G_r) are irradiated in the first and second plane (E_1, E_2) in

the radiation area (56) in the irradiation position.

55. Process as claimed in claim 48, 49, 52, 53, wherein at the same time flexible pipe (G_{fr}) and an individual item (G_s) are irradiated in the first and third plane (E_1, E_3) in the radiation area (56) in the irradiation position.

56. Process as claimed in claim 48, wherein several thin pipes or bars are introduced into the bar-shaped/pipe-shaped article and are supplied jointly to irradiation.